

Midland 70-066

Conversion

To

6 Meters

Ver 2.9 – 16 Nov 2009

Part 1

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Midland 70-066 low Band Conversion to 6 Meters:

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Part 6A: The Midland 70-066 Manual 1

Part 6B: The Midland 70-066 Manual 2

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NOTE:

PLEASE READ THIS

DOCUMENT.

It has been noted that the majority of mistakes have been caused by users NOT reading this documentation before or during the conversion.

If any mistakes are found, or a suggestion for a better document, please send your comments to:-

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Acknowledgment:

This project was started in June 2008 by John Cain VK7CEJ suggesting that one tries to convert an AWA RT85 low band commercial radio transceiver to 6 meters. John also forwarded a number of AWA85's to me. Acknowledgement must be given to:- Steve VK2KFJ, Peter VK2ZZA, Roger Baker VK3BKR, Mark Detering VK3TLW, Phil Rice VK3BHR, Mark VK3BYY, Phil VK1PL who converted me to the Midland family of transceivers, Andrew VK4OX for the information gained from their past documentation and generous guidance. Warwick VK4NW for the PA Modifications.

Modifications Time:

The modifications contained within this document should take the average non technical amateur, the following time's:->

	Modifications	Alignment	
EPROM board	1 hour	Nil	
The Synthesizer board	1 hour	1 hour	
The Receiver board	1 hour	1 hour	
The Transmitter PA board	1 hour	1 hour	
Total:	4 hours	3 hours	Overall 7 hours.

All Parts Needed:

IC Socket – Low profile 24 pin - 1 of [Jaycar PI-6506] (If you do not have a Z-273 burner)

All Midland 70-066 Parts Needed:

Capacitors.		Jaycar	
2.2pF	- 2 of	RC-5304	Note: All capacitors are 50V Ceramic
4.7pF	- 1 of	RC-5308	
5.6pF	- 3 of	RC-5309	
8.2pF	- 3 of	RC-5311	
22 pF	- 7 of	RC-5316	
27 pF	- 2 of	RC-5217	
33 pF	- 1 of	RC-5218	
39 pF	- 2 of	RC-5219	
100 pF	- 1 of	RC-5324	
1000 pF	- 1 of	RC-5336	

Note: If you acquire your capacitors from “Jaycar Electronics”, then please check the capacitor values in each packet. It has been found that, **incorrect values** have been added to packets of capacitors.

For the first few weeks of the conversion - you will need a box or A4 plastic bag to hold your screws and plates of the transceivers. Plus a 24 pin low profile IC socket [if you do not have a Z-273 board burner, 2 of 22pf capacitors, a 5.6pf capacitor, approximately 1 meter of about 0.63mm enamel coated wire & a reel of solder wick. On the first night of conversion you will need a Philips screwdriver. Later on, you will need a 5mm drill bit to wind your coils on.

Wire.

Approximately 10cm of 0.5mm (**NOTE:** 0.63mm wire will do the job)
Approximately 1 meter of 0.63mm [22bs] enameled coated wire [Jaycar WW4018].

Markers.

Masking Tape.

Marking Pen. [for putting coil numbers on Masking tape in Tx PA section]

Drill Bit. Size – 5mm

If your transceiver has no FUSE attached to the power cable, you are advised to purchase & install one before you test the transceiver.

Parts needed First Night:

For Synthesizer:

2 of **22pF** ceramic Capacitors Jaycar RC-5216

1 of **5.6pF** ceramic Capacitor Jaycar RC-5309

1 of **24 pin** low profile socket Jaycar PI-6506

Approximately 100 mm of **0.63mm** [22bs] enameled coated wire [Jaycar WW4018].

Masking Tape.

Marking Pen. [for putting coil numbers on Masking tape in synthesizer section and marking panels & PCB's]

Drill Bit Size – 5mm

Small plastic bag to keep screws and coils in.

A4 plastic bag to keep covers in.

12 volt **power cable** with Molex plug [approx 1 meter] if a Midland 70-066 and an in-line 10Amp **fuse**, will be needed in approx three weeks for testing the transceiver.

Test Equipment needed:

Hex tuning tool.
Flat blade tuning tool.
Voltmeter.
Signal Generator.
VSWR Meter and/or RF Power meter
Soldering Iron.
De-soldering equipment.
Sharp knife or scalpel.
Philips screwdriver
Wire cutters.
Needle nose pliers – small size.

Conversion Project Overview.

There are five major events to modify your raw low band transceiver.

- **Initially - Test transceiver.** [This has to be done before any other operation.] This operation should take one night for all users to be satisfied that their transceiver **works!!**

If you not happy with your soldering, then become a partner with somebody that is competent with soldering.
- **Z-273 EPROM Modifications.** Either use a Z-273 board programmer or; remove the EPROM from the Z-273 PCB, solder in a low profile 22 pin socket into the 2716 EPROM holes, reprogram the 2716 EPROM & place into the 22 pin socket.
- **Synthesizer Modification.** Remove PCB board, remove coil, make coil, replace board, place capacitors onto underside of board, synthesizer alignment and replace PCB board into transceiver. In this part, you will use test equipment. [ie Frequency counter & DC meter. Plus tuning tools.]
- **Receiver Modification.** Remove PCB board, solder place capacitors onto underside of board, alignment of Receiver and replace PCB board into transceiver. In this part, you will use test equipment. [ie Signal Generator & DC meter. Plus tuning tools.]
- **Transmitter PA Modifications.** Remove PCB board, remove coils, make coils, solder capacitors and coils onto underside of board, alignment of Transmitter and replace PCB board into transceiver. In this part, you will use test equipment. [ie RF Power meter & DC meter. Plus tuning tools.]

The Z-273 EPROM Modifications and Synthesizer Modification must be done first, before alignment can be done

For members not savvy with the use of Test Equipment, please find an amateur who will be available to guide you in alignment procedures.

Midland 70-066 Conversion to 6 Meters - Procedures:

- **Transceiver.**

Clean transceiver.

Add power cables & speaker link.

Make sure that you have a microphone.

--- Test out the transceiver on its original frequency.

- **Z-273 boards.**

Z-273 boards should be programmed or;

Solder 24pin low profile socket to Z-273 Module.

Burn 2716 EPROM with 6 meter frequencies.

Plug in 2716 EPROM into 22 pin socket on Z-273 PCB.

- **Synthesizer Board.**

Remove Synthesizer Board from transceiver.

Wind new Synthesizer Coil.

*** De-solder synthesizer coil from Synthesizer PCB.

Add new L114 coil & Capacitors C137, C709 & C across L709

Place synthesizer board back into transceiver.

Insert Z-273 PCB into Synthesizer board & attach cable to PCB.

--- Align synthesizer.

- **Receiver board.**

Partially remove receiver board from the transceiver. Leave power connections connected.

Add capacitors to receiver PCB.

Place receiver PCB back into transceiver.

--- Align receiver.

- **Transmitter PA.**

Totally remove transmitter PA PCB from transceiver.

*** Remove coils from PA PCB.

Wind new coils for PA PCB.

Add new coils & capacitors to PA PCB.

Place transmitter PA PCB back into transceiver.

--- Align transmitter PA.

- Check on air.

*** = Use of de-soldering station.

= Use of soldering iron.

--- = Use of test equipment.

Midland Land Mobile Model and Features Table for 70-066 & 70-076:

Syntech I

<u>Model</u>	<u>Type</u>	<u>Split</u>	<u>Power</u>	<u>Channels</u>	<u>Comments</u>
70-066	ST1	66-80 mhz	40 watt	80	Dash Mount mid band
70-076	ST1	66-80 mhz	40 watt	80	Trunk Mount mid band

Models = A-66-80 Mhz B-75-88 Mhz



Above - Front View of Midland 70-066A with Local Head,



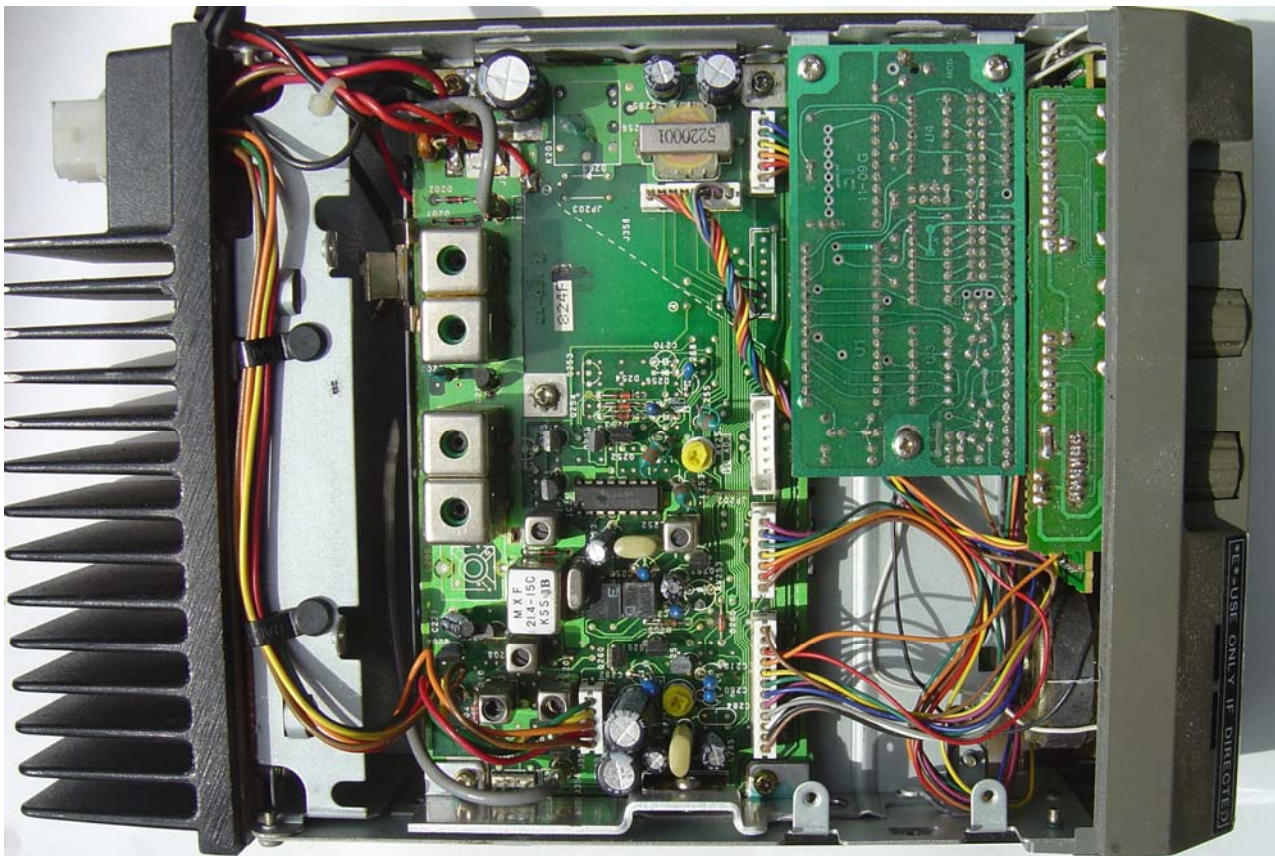
Above – Bottom View of Midland 70-066A with Local Head:



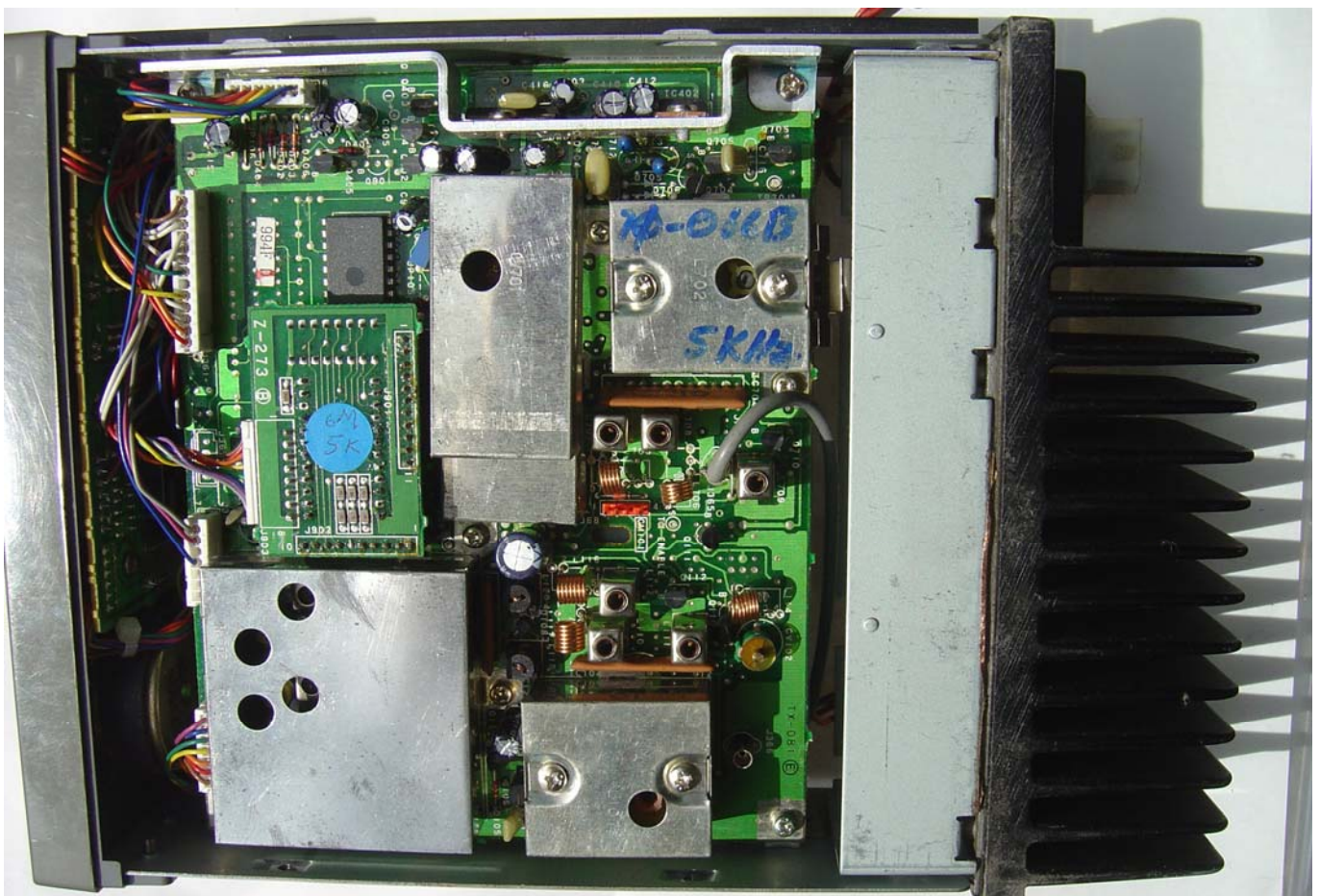
Above –Midland 70-076 Case View,



Above – Midland 70-076 with Remote Head:



Above – Bottom View of Midland 70-066 Receiver side with Local Head:



Above – Top View of Midland 70-066 Receiver side with Local Head:

6 METER Midland 70-066 FM FREQUENCIES – Normal EPROM:

VK2DOT Midland 70-066 & AWA RT85 Frequency Source File - 6m-5k.fre

70-066	[RT85, 70-066 or BLANK]	Transceiver Type
5	[2.5, 5, 10, 12.5 or BLANK]		Khz Frequency Step
HIGH	[LOW, HIGH or BLANK]	Local Oscillator Injection
21.4	[10.7, 21.4, 47.0 or BLANK]		Mhz Rx IF Frequency
20.48	[9.6, 10.24, 19.2, 20.48 or BLANK]		Mhz Tx IF Frequency

Ch	Scan	Rx	Tx	CTCSS	Callsign	Service Area
01	0	53.5500	52.5500		Repeater VK2RIC NSW Lismore-Casino	
					VK3RMH Vic NE Melbourne	
02	0	53.5750	52.5750	123	Repeater VK2RSM NSW Snowy Mountain no-123	
				123	VK2RPW NSW Walcha	
					VK3RDD Vic Dandenong	
03	0	53.6000	52.6000		Repeater VK2RNW NSW Narrabri	
					VK3RMR Vic Gippsland	
04	1	53.6250	52.6250		Repeater VK2RSN NSW Newcastle	
					VK3RHF Vic East Melbourne	
					VK4RXD Qld Sunshine Coast ???	
					NZ Central Otago	
05	1	53.6500	52.6500	123	Repeater VK2RMP NSW Wollongong	
					VK3RWZ Vic Grampians Proposed	
06	1	53.6750	52.6750	123	Repeater VK2RMB NSW Terry Hills Sydney Broken	
					VK3RAD Vic Melbourne East	
					VK3RTN Vic NE Vic	
07	0	53.7000	52.7000		Repeater VK2RGN NSW Goulburn ???	
					VK4RSN Qld Sunshine Coast ???	
08	1	53.7250	52.7250	123	Repeater VK2RAG NSW Central Coast 2012 we think	
					VK4RGA Qld Gladstone	
					VK4RLB Qld Woodridge/BrisbaneSouth	
					VK3RGV Vic Shepparton	
					NZ Auckland	
09	0	53.7500	52.7500		Repeater VK5RSB SA Summertown/Adelaide	
					NZ Wellington	
10	0	53.7750	52.7750		Repeater VK5RLZ SA Adelaide North	
					VK4RRC Qld Redcliffe/N Brisbane ???	
					VK4RBG Qld Bundaberg	
					VK4RBP Qld Atherton Tableland	
11	0	53.8000	52.8000	123	Repeater VK6RAP WA Roleystone/Perth no-123	
				123	VK4RGO Qld Gold Coast	
					NZ Mt Climie [NE Wellington]	
12	0	53.8250	52.8250		Repeater VK7RAD Tas Hobart/Derwent Valley	
					VK7RNW Tas Ulverstone N/W Coast	
13	1	53.8500	52.8500	123	Repeater VK2RWI NSW Dural/Sydney	
					NZ Christchurch	
14	1	53.8750	52.8750	123	Repeater VK2RBM NSW Lawson/Blue Mts	
					VK7RAA Tas Mt Barrow/N Tas	
15	0	53.9000	52.9000		Repeater VK3RMS Vic East Melbourne	
16	0	53.9250	52.9250		Repeater VK1RGI ACT Mt Ginini ACT & SE NSW	
					VK4RBX Qld Ipswich	
17	0	53.9500	52.9500		Repeater VK4RBL Qld Brisbane South	
18	0	53.9750	52.9750		Repeater VK3RGM Vic Mt Buller NE Vic	
					VK4RBR Qld Mt Gravatt Brisbane	
19	1	52.5000	52.5000		Voice International calling frequency	
20	1	52.5250	52.5250		Voice National Calling Frequency	
					Repeater Reverse Channels	
21	0	52.5500	53.5500		Reverse channel # 1	
22	0	52.5750	53.5750		Reverse channel # 2	
23	0	52.6000	53.6000		Reverse channel # 3	
24	0	52.6250	53.6250		Reverse channel # 4	

25	0	52.6500	53.6500	Reverse channel # 5
26	0	52.6750	53.6750	Reverse channel # 6
27	0	52.7000	53.7000	Reverse channel # 7
28	0	52.7250	53.7250	Reverse channel # 8
29	0	52.7500	53.7500	Reverse channel # 9
30	0	52.7750	53.7750	Reverse channel #10
31	0	52.8000	53.8000	Reverse channel #11
32	0	52.8250	53.8250	Reverse channel #12
33	0	52.8500	53.8500	Reverse channel #13
34	0	52.8750	53.8750	Reverse channel #14
35	0	52.9000	53.9000	Reverse channel #15
36	0	52.9250	53.9250	Reverse channel #16
37	0	52.9500	53.9500	Reverse channel #17
38	0	52.9750	53.9750	Reverse channel #18

Data Channels

39	0	53.0000	53.0000
40	0	53.0250	53.0250
41	0	53.0500	53.0500
42	0	53.0750	53.0750
43	0	53.1000	53.1000

Voice Simplex Channels

44	0	53.1250	53.1250
45	0	53.1500	53.1500
46	0	53.1750	53.1750
47	0	53.2000	53.2000
48	0	53.2250	53.2250
49	0	53.2500	53.2500
50	0	53.2500	53.2750
51	0	53.3000	53.3000
52	0	53.3250	53.3250
53	0	53.3500	53.3500
54	0	53.3750	53.3750
55	0	53.4000	53.4000
56	0	53.4250	53.4250
57	0	53.4500	53.4500
58	0	53.4750	53.4750
59	0	53.5000	53.5000
60	0	53.5250	53.5250

WICEN

Repeater Simplex

61	0	53.5500	53.5500
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“Bugs Juice” The original brew from Bruce VK2ZAD but text modified by Rod VK2DOT.

The following concoction is recommended for users of this document to brew up, this brew will enable your de-soldering to become easier.

Rosin and Methylated Spirits are purchased from your local hardware store.

To brew up this **“Bugs Juice”**:

- Crush lumps of rosin and place in a jar or a small tin can with an air tight lid.
- Cover the rosin in the jar or can with methylated spirits.
- Apply the air tight lid and allow to dissolve.
- If the final solution is too thick, then thin with more methylated spirits.
- If the final solution is too thin, then thicken by adding more rosin.
- Apply to the surface to be de-soldered with a small brush, old toothbrush or icy pole stick. We have found that a wooden **tooth pick** has been the most successful method of applying the Bugs Juice to the pin requiring de-soldering.

VK2DOT EPROM Software: [other than Z-273 programmer]

Firmware.

m6m-5k.bin Binary file for EPROM burning using Midland 70-066B 61 Channel frequency step 5Khz.
m6m-25k.bin Binary file for EPROM burning using Midland 70-066A 61 Channel frequency step 2.5Khz.

Software.

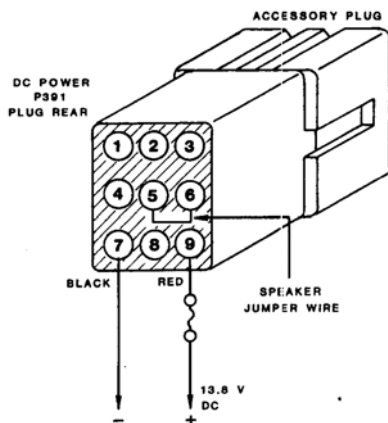
Software Description:

The RT85 6 meter firmware generator Software has the following functions and restrictions:-

- Software will operate under DOS or Windows & from a floppy or hard drive or from a USB stick.
- Software works for AWA RT85 Low Band and Midland 70-066A or B for 6 Meters.
- The CTCSS for the Midland 70-066 works.
- The CTCSS for the AWA RT85 has to be checked.
- The 10Khz and 12.5Khz Frequency step has not been checked.
- Bands other than 6 Meters have to be checked.

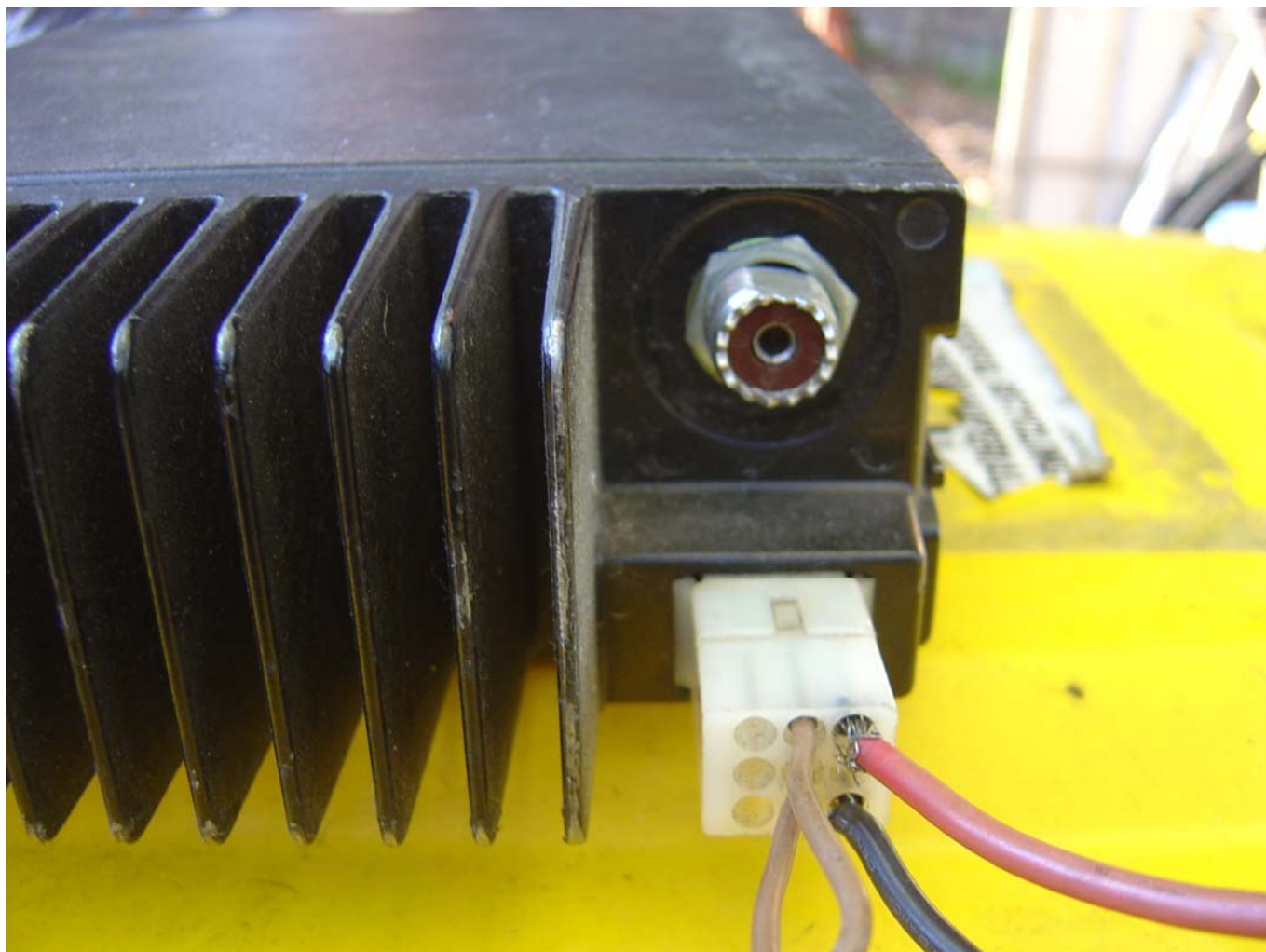
Power Plug:

NOTE: If you do not jumper pins 5 & 6, your internal speaker will not work. The CCARC Midland 70-066B transceivers **do not** have power plugs.





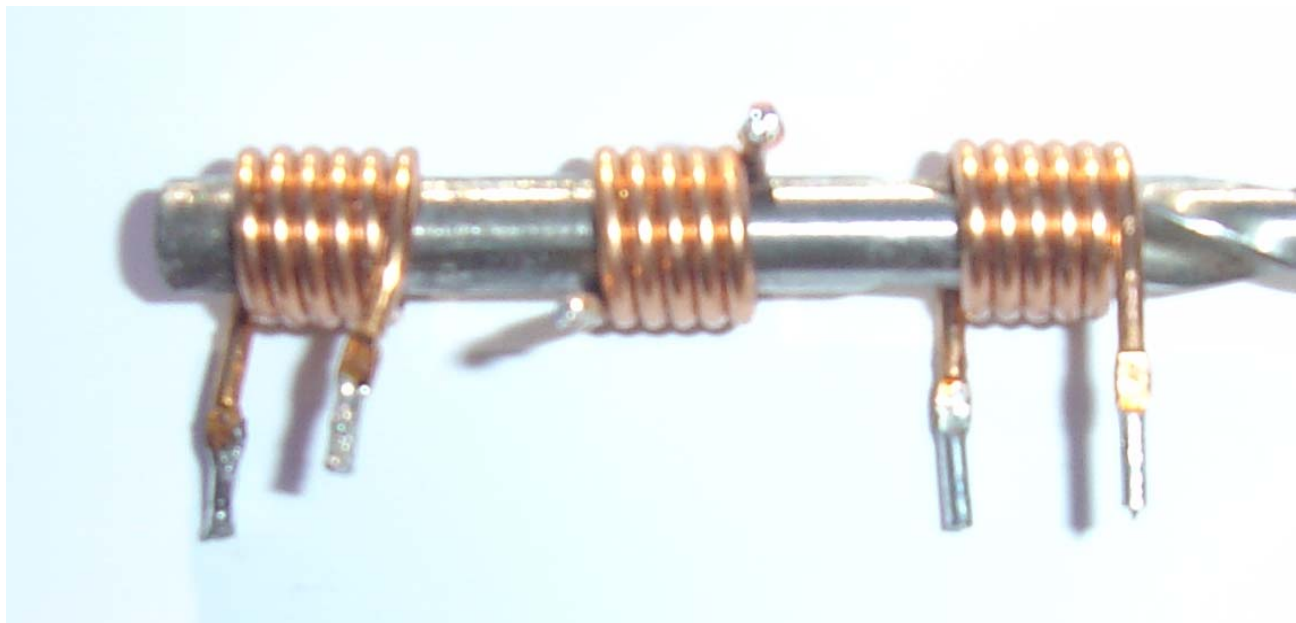
NOTE: Connector WW's are opposite red & black power leads. Brown lead is internal speaker loop. In the photo above, the WW's are closest to the heat fins.



It has been suggested by Ken VK2KJ, that if you cannot locate a Molex plug for the midland 70-066 transceiver - Remove the power socket female pins by using a very small jeweler's screwdriver to bend back the locking fins. This is made easier by reshaping the pin socket diameter to gain access to the fins.

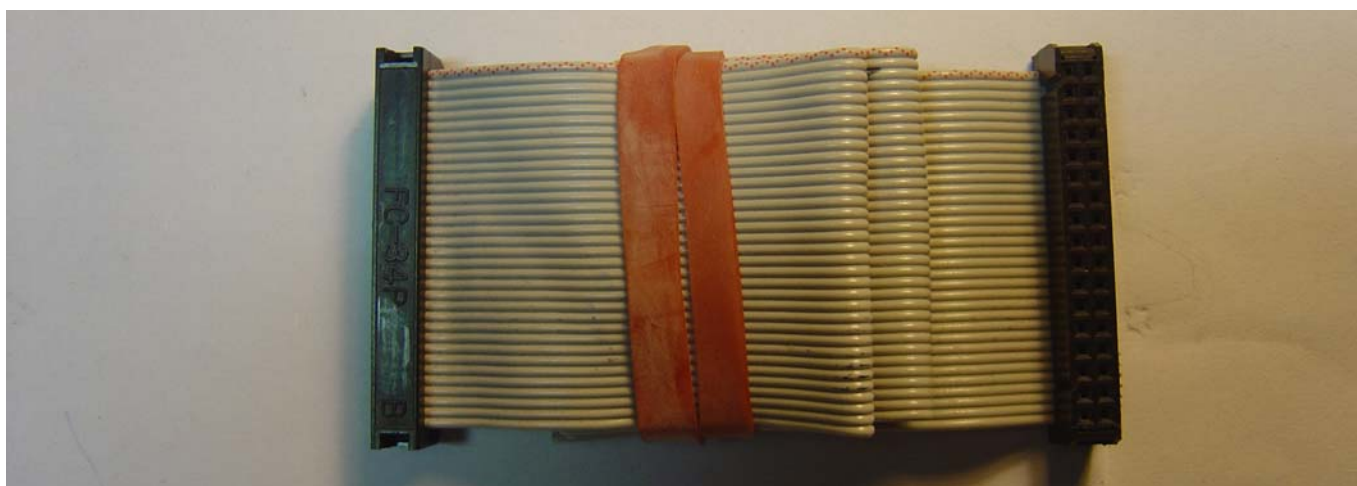
When both fins are pushed down the pin will retract from the rear of the socket. Feed the new power cable through the Molex socket and through the socket end of the pin soldering the cable to crimp area. Now open the fins slightly and pull cable back to lock the pin into position. The same can be carried out for the speaker jumper for those who are not using remote speaker.

COUNTING COIL TURNS:



Look at center coil above, run sharp object between legs. That is how you count turns on a coil.

Remote cable for Midland 70-076 Head:



NOTE: Connectors are reversed at the ends of the cable. [Computer cables work OK]